



Big Data Factors Toward Enhancing United Arab Emirates Drug Inventory Management System for Effective Decision-Making

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ABSTRACT

The study examines the impact of big data on drug inventory management systems in the UAE. Data from 297 healthcare professionals was collected using Smart PLS. The analysis revealed significant relationships between data integration, processing, quality, information sharing, effective decision-making, and the effectiveness of the drug inventory management system. Data integration, processing, and quality directly impact inventory management outcomes, while information sharing, and effective decision-making mediate the relationship. The findings emphasize the importance of integrating disparate data sources, using robust data processing techniques, ensuring data quality, fostering information sharing, and enhancing decision-making skills in drug inventory management. Practical recommendations for healthcare organizations include prioritizing data integration, implementing advanced data processing techniques, ensuring data quality, fostering information sharing, and promoting effective decision-making.

1. Introduction

Drug inventory management (DIM) is a crucial aspect of healthcare systems. It involves managing and controlling the storage, procurement, dispensing, and usage of drugs within a healthcare institution (Raman et al., 2018). Effective drug inventory management is key to ensuring the availability of necessary medications, minimizing wastage, reducing costs, and ultimately, improving patient care outcomes (Aljumah et al., 2021). In recent years, the advent of big data has provided significant opportunities for enhancing drug inventory management systems. Big data, in the context of healthcare, refers to the vast amounts of data generated from various sources, including patient records, clinical trials, drug databases, and other electronic health records (Albqowr et al., 2022). This data, when effectively managed and utilized, can inform decision-making processes related to drug procurement, distribution, and control, leading to improved DIM efficiency. Several big data factors, acting as independent variables, are instrumental in shaping the effectiveness of decision-making processes within DIM systems. These include data integration, processing, quality, security, and information sharing (Alrahbi et al., 2022). Data integration refers to the process of combining data from different sources to provide a unified view of drug inventory levels. Data processing, on the other hand, entails the analysis of large volumes of data to extract useful insights. Ensuring data quality - that is, the accuracy, completeness, and consistency of data - is critical to making informed decisions. Furthermore, data security involves protecting sensitive healthcare data, while information sharing refers to the exchange of data between healthcare providers to improve decision-making (Taleb et al., 2015). Effective decision-making, the mediator variable in this context, plays a key role in the link between big data management and drug inventory management. Decisions about procurement, distribution, and control of drug inventory must be timely, informed, and consider multiple alternatives (Abu Ghazaleh and Zabadi, 2020). When these decisions are based on big data analysis, healthcare providers can better predict drug demand, prevent shortages, reduce wastage, and enhance patient care outcomes.

The United Arab Emirates (UAE) healthcare sector has been undergoing rapid development and expansion, aiming to provide world-class healthcare services to its residents. One critical aspect of these services is the effective management of drug inventory to ensure that medications are available when needed, without creating excessive storage costs or waste due to expired drugs. Drug inventory management includes processes related to procuring, storing, distributing, and controlling medications within healthcare institutions. In the era of big data, healthcare providers have access to vast amounts of data that can be utilized to optimize drug inventory management (Mehta and Shukla, 2021). For instance, data on drug consumption patterns, patient demand, and supplier delivery times can be analyzed to make informed decisions on when to order medications, how much to order, and how to distribute them effectively. Therefore, harnessing the power of big data has the potential to transform the

UAE's drug inventory management system, improving efficiency, reducing costs, and ultimately enhancing patient care outcomes. However, effective data management presents significant challenges. For instance, data may be dispersed across different systems, making it difficult to integrate and process. Additionally, data quality issues can lead to incorrect decisions, while inadequate data security measures can put sensitive healthcare data at risk. Overcoming these challenges requires a holistic approach, encompassing technological, organizational, and human factors. Technological factors enabled much more complex computing tasks, launching a comprehensive approach for various advancement contributions (Araya, Dahalan, & Muhammad, 2021).

One of the main issues in the UAE drug inventory management system is the lack of effective data integration and processing (Khan, 2019). Healthcare providers in the UAE may have access to vast amounts of data related to drug inventory levels, patient demand, and supplier delivery times, but the data may be siloed or dispersed across multiple systems, making it difficult to gain a unified view of drug inventory levels and make informed decisions. Additionally, there are challenges related to data quality and security, as well as a lack of information sharing between healthcare providers (Poma et al., 2020). Poor data quality lead to incorrect decisions, wastage, and shortages, while inadequate data security measures put sensitive healthcare data at risk (Aljumah et al., 2021). Additionally, a lack of information sharing lead to a lack of transparency and collaboration between healthcare providers, making it difficult to optimize inventory levels and reduce the risk of shortages (Albqowr et al., 2022). The advent of big data and the digitization of healthcare processes have provided significant opportunities for improving drug inventory management systems. However, there remain substantial challenges in effectively harnessing big data to enhance decision-making processes within these systems, particularly in the United Arab Emirates (UAE) healthcare sector.

2. Theoretical Literature and Hypothesis Development

This research is grounded in three theoretical frameworks: Information Processing Theory, Resource-Based Theory, and the Rational Decision-Making Model. These frameworks provide a structured lens for understanding and exploring the role of big data factors in the drug inventory management system, especially within the UAE's healthcare sector. This research will rely on Information processing theory, Resource-based theory, and rational decision-making model. Information processing theory helps to understand how healthcare providers process and use information related to drug inventory levels, patient demand, and supplier delivery times. This theory guides the research's focus on how healthcare providers acquire, store, retrieve, and use information to make informed decisions related to drug inventory management. Resource-based theory helps to identify how effective data management strategies and Big Data and ERP technologies provide a competitive advantage to healthcare providers. This theory guides the research's focus on how healthcare providers leverage their resources and capabilities to optimize drug supply chains and minimize shortages through effective data management. Finally, the rational decision-making model helps to understand how healthcare providers make decisions related to drug inventory management and how data management helps to improve these decision-making processes. This model guides the research's focus on the processes and methods used by healthcare providers to make decisions, as well as how data management improves the accuracy and efficiency of these decisions.

2.1 Big Data in Healthcare

Big data, characterized by its volume, variety, and velocity, are increasingly reshaping the healthcare sector. It encompasses diverse information from patient records to clinical trial data, and operational outputs (Raghupathi and Raghupathi, 2014). Its applications span predicting epidemics, improving quality of life, reducing healthcare costs, and enhancing decision-making processes and operational efficiency (Belle et al., 2015). Despite its vast potential, the sector struggles with challenges in data management, integration, security, and privacy, all critical factors in areas such as drug inventory management (Sun et al., 2017). Healthcare, known for its complexity, can significantly benefit from big data's potential in enhancing decision-making processes. By analyzing this data, providers can identify patterns and correlations that inform various decisions from patient care to operational efficiency (Raghupathi and Raghupathi, 2014). Big data offers actionable insights, predictive analysis, and decision support, promoting a better understanding of diseases, patient management, health trends identification, and preventive strategies (Belle et al., 2016). However, healthcare organizations must surmount various challenges, including data security, privacy, data integration, data quality, and the need for improved data analysis skills, to fully exploit big data's potential (Sun et al., 2017). In the realm of drug inventory management, big data analytics can facilitate effective decision-making, leading to improved forecasting, efficient inventory control, reduced wastage, and better patient care (Khan, 2019). Yet, the application of big data in this context, particularly in the UAE healthcare sector, remains under-researched (Aljumah et al., 2021). As healthcare providers grapple with effective big data integration and application in their systems, effective management, and utilization of big data, especially in drug inventory management, emerges as a critical research area (El Khatib et al., 2022).

2.2 Big Data Factors Affecting Decision Making

Key big data factors significantly shape decision-making in healthcare, notably data integration and data processing. Data integration merges data from various sources into a comprehensive view, reducing inconsistencies and redundancies, and thus improving care quality (Dwivedi et al., 2021). Additionally, data processing, which includes data mining and analytics, influences the speed and efficiency of decision-making. Advanced tools facilitate pattern recognition, trend identification, and future predictions, which are crucial for informed decisions (Wang et al., 2018). These processes, while challenging due to healthcare data heterogeneity, allow for a unified view of drug inventory levels, patient demand, and supplier delivery times, which aids informed decision-making and optimizes drug inventory management (Almatarneh and Gamble, 2018). The quality and security of data are also fundamental. Data quality, encompassing accuracy, consistency, and reliability, underpins decision reliability. Inaccurate or incomplete data can lead to flawed decisions that negatively affect healthcare services and patient outcomes (Li et al., 2016). In the context of drug inventory management, poor data quality can result in incorrect decisions, leading to drug wastage or shortages, underscoring the importance of high data quality for effective decision-making (Wang et al., 2016). Given healthcare data's sensitive nature, its security is paramount, with data breaches potentially compromising patient privacy, trust, and decision-making capacity (Khan and Fotakopoulou, 2020; Martínez-Córcoles et al., 2019).

Finally, information sharing among healthcare providers enhances the decision-making process. By promoting collaboration and transparency, shared information ensures comprehensive, up-to-date data-driven decisions (Sharma et al., 2016). Particularly in drug inventory management, information sharing facilitates accurate patient demand prediction, aiding in preventing drug shortages (Aral et al., 2013). By understanding these significant big data factors, healthcare providers can improve decision-making processes, enhance drug inventory management efficiency, and ultimately improve patient care outcomes.

2.3 Decision Making in Drug Inventory Management

Effective drug inventory management in healthcare is pivotal for ensuring timely access to medications for patients. It involves tracking drug usage, managing stock levels, preventing stockouts or overstocking, minimizing wastage, and managing supplier relationships (Kumar and Chandra, 2012; Datta et al., 2019). In this process, big data can enhance efficiency by analyzing patterns in drug usage, predicting future demand, and tracking supplier delivery times. Further, big data assists healthcare providers in identifying potential issues early, enhancing the effectiveness of drug inventory management (Yousefi and Yousefi, 2017; Rao, 2017). Consequently, understanding the relationship between big data, decision-making, and drug inventory management becomes crucial for optimizing healthcare delivery. Decision-making in drug inventory management is multifaceted, requiring consideration of drug demand, supply, storage conditions, expiry dates, and cost-effectiveness, among others. The availability of big data can transform this process by providing accurate, timely, and comprehensive information. Leveraging big data for forecasting drug demand can optimize inventory levels and reduce shortage risks (Syed et al., 2018). Additionally, big data aids in evaluating supplier performance, including delivery times, late delivery frequency, and product quality, thereby informing decisions about supplier relationships (Gunasekaran et al., 2017). Moreover, big data provides insights into cost-effectiveness, revealing costs associated with overstocking, like storage and wastage, or understocking, like emergency procurement (Banerjee and Mishra, 2017). Big data also supports decisions related to the secure and ethical handling of drugs. By tracking the movement of drugs within and between healthcare facilities, big data helps prevent theft and misuse (Kumar and Rahman, 2020). In essence, decision-making in drug inventory management necessitates consideration of various factors, and big data can offer valuable insights to guide these decisions. Therefore, big data emerges as a potent tool for enhancing decision-making processes, improving drug inventory management efficiency, and ultimately leading to improved patient care outcomes.

2.4 Drug Inventory Management System in UAE

In the United Arab Emirates (UAE), the drug inventory management system holds a pivotal role in healthcare, ensuring timely access to necessary medication for patients. This system covers an array of operations, including procurement, storage, distribution, and drug dispensation. Its importance for optimal patient care in the UAE has been demonstrated in numerous studies (Al-Tamimi, 2018). However, persistent drug shortages pose significant challenges to this system, compromising the provision of optimal patient care (Hussain et al., 2020). The complexity of the UAE's drug inventory management system arises from the diversity of medicines, each with distinct demand patterns, storage conditions, expiry dates, and costs. Coupled with the rapidly evolving healthcare sector and increasing patient expectations, it necessitates a sophisticated management system

(Al-Tamimi, 2018). Big data can enhance decision-making, facilitate accurate drug demand prediction, and optimize inventory levels, contributing to resolving these challenges. Moreover, the rapidly growing and increasingly sophisticated UAE healthcare sector requires advanced technologies, including big data analytics, for maintaining world-class healthcare services (Poma et al., 2020). Despite the potential of big data, integrating it into the drug inventory management system presents challenges, particularly concerning data integration, processing, and security (El Khatib et al., 2022). Nonetheless, successfully addressing these issues could lead to significant advancements in the UAE healthcare sector toward a more efficient and patient-centric drug inventory management system. In summary, incorporating big data analytics into the UAE's drug inventory management system can optimize decision-making processes, enhance inventory management, and consequently improve patient care outcomes.

2.5. The Interest of the Hypotheses of the Study

Developing the following hypotheses presents a significant interest as they are poised to expand the understanding of the role of big data in healthcare, particularly within the domain of drug inventory management in the UAE. Exploring the impact of different aspects of big data, such as data integration, processing, quality, security, and information sharing, on decision-making processes will provide deeper insights into their significance and potential utilization for better outcomes. Furthermore, these hypotheses aim to pinpoint the elements that can enhance decision-making, which in turn can optimize the efficiency and effectiveness of drug inventory management, thereby leading to improved patient care and potential cost savings. The assertion of a connection between big data and inventory management based on these hypotheses could serve as a robust premise for initiating advancements in the healthcare sector. In addition, the hypotheses propose to investigate the mediating role of effective decision-making. This exploration could unveil the indirect influences that big data elements have on the effectiveness of the drug inventory management system, presenting a nuanced perspective that could be of immense value in policy and system design. The verification of these hypotheses could also offer pivotal insights for policy formulation and practical applications in the UAE's healthcare sector. The evidence-based understanding would guide healthcare providers, managers, and policymakers to better harness big data and make improved decisions concerning drug inventory management. Lastly, the development of these hypotheses sets a precedent for future research in this area. Establishing a direction for probing into the influence of big data on healthcare decision-making, it will stimulate further exploration, thereby contributing to the growth of the knowledge base in this crucial area. The proposed framework for improving the UAE drug inventory management system through effective decision-making aligns with several theoretical models, including the Information Processing Theory (IPT), the Resource-Based Theory (RBT), and the Rational Decision-Making Model.

The IPT provides a foundation for understanding how data is used in decision-making processes. This theory posits that the quality and quantity of information can significantly impact decision-making. In the proposed framework, the importance of data integration, data processing, and data quality in facilitating effective decision-making in drug inventory management echoes the IPT. It emphasizes that healthcare providers need to process high-quality data accurately and efficiently to make informed decisions (El Morr and Subercaze, 2020; Al-Khoury, 2012). The RBT supports the framework's emphasis on data security and information sharing. According to the RBT, resources that are valuable, rare, inimitable, and non-substitutable can provide a competitive advantage. In the context of the proposed framework, secure and unique data is a valuable resource that can improve decision-making processes and enhance the effectiveness of drug inventory management systems (Al-Khoury, 2012). Moreover, the sharing of this information across the healthcare system, if managed effectively, can lead to improved inventory management practices and better patient care outcomes. The Rational Decision-Making Model aligns with the proposed framework's emphasis on the role of effective decision-making in enhancing the effectiveness of drug inventory management systems. This model suggests that decision-makers follow a sequence of steps to make rational choices, starting from problem identification, through the gathering and evaluation of information, to the selection and implementation of the best alternative. The proposed framework underlines the significance of using quality data (integration, processing, and security) and information sharing to make rational and effective decisions about drug inventory management, thereby enhancing its effectiveness (Hussain et al., 2020; Bin Hamza et al., 2020; Al Ameri et al., 2020). In summary, the proposed framework integrates the principles of IPT, RBT, and the Rational Decision-Making Model to offer a comprehensive approach to improving decision-making processes and the effectiveness of drug inventory management systems in the UAE.

2.6. Hypothesis Development

Several studies have found a positive association between data integration and decision-making effectiveness in healthcare settings. For example, a research by Tursunbayeva et al. (2017) found that data integration enhances decision-making efficiency

in healthcare organizations by providing accurate and timely information about drug inventory levels. Similarly, research by Dwivedi et al. (2021) found that data integration plays a critical role in improving decision-making effectiveness in healthcare supply chains.

H1: There is a significant relationship between data integration and effective decision making in the UAE drug inventory management system.

Furthermore, Ye et al. (2020) argued that data processing, especially with the help of artificial intelligence and machine learning techniques, could significantly improve decision-making processes in the healthcare sector, including in drug inventory management.

H2: There is a significant relationship between data processing and effective decision making in the UAE drug inventory management system.

In the context of the UAE, research by El Morr and Subercaze (2020) corroborates that data quality significantly impacts decision-making in the healthcare sector.

H3: There is a significant relationship between data quality and effective decision making in the UAE drug inventory management system.

In the context of UAE healthcare, Al-Khouri (2012) confirms the importance of data security in health information systems, noting that it is a critical factor in decision-making.

H4: There is a significant relationship between data security and effective decision making in the UAE drug inventory management system.

A research by Chen, Zhang, and Zhao (2017) supports this assertion, arguing that information sharing can enhance the efficiency of decision-making processes by providing decision-makers with more accurate and comprehensive data. In the context of healthcare, Simatupang and Sridharan (2005) assert that information sharing can improve the coordination of activities and reduce the uncertainty associated with decision-making. Specifically in the UAE healthcare context, Al Zarooni and Deeb (2021) point out that increased transparency and information sharing among healthcare institutions could significantly improve decision-making processes in drug inventory management.

H5: There is a significant relationship between information sharing and effective decision making in the UAE drug inventory management system.

Abu Ghazaleh & Zabadi (2020) emphasize that healthcare professionals must consider the clinical effectiveness, safety, and cost-effectiveness of drugs in the decision-making process, along with their availability. Effective decision making in drug inventory management systems ensures the availability of drugs, optimizes inventory levels, reduces stockouts and wastage, and ultimately improves patient care outcomes. Effective decision making plays a vital role in the overall effectiveness of drug inventory management systems in the UAE. It enables healthcare professionals and administrators to make informed choices based on accurate data, enhancing the efficiency of the drug inventory management system. By optimizing inventory levels, minimizing shortages, and reducing wastage, effective decision making contributes to improved patient care and resource utilization in the healthcare system.

H6: Effective decision making has a significant impact on the effectiveness of the drug inventory management system in the UAE.

Research points to the significant mediating role of effective decision-making in the relationship between data integration and data processing with the performance of healthcare information systems (Shahmoradi et al., 2017; Ghanem et al., 2019). In UAE's advancing technological healthcare landscape, effective decision-making becomes crucial in leveraging integrated and processed data for improving drug inventory management practices (Bin Hamza et al., 2020). The relationship between these data management techniques and inventory management effectiveness underscores how accurate, timely, and accessible information can enhance forecasting, trend identification, and proactive decision-making regarding drug supply and distribution. Information sharing, crucial for seamless communication and collaboration among healthcare professionals, has a mediated relationship with the effectiveness of drug inventory management through effective decision-making processes. As decision-makers convert shared information into actionable insights, it significantly influences inventory management practices, including drug ordering, stock handling, and distribution (Al Ameri et al., 2020). Thus, information sharing serves as a critical conduit for informed decision-making in drug inventory management, underpinning the system's overall effectiveness. Further underscoring the relevance of effective decision-making, previous research highlights its mediating role between information sharing and healthcare performance (Alameri et al., 2021). Efficient use of shared information improves coordination among stakeholders and optimizes drug supply and distribution processes, thereby enhancing inventory management practices. Therefore, the ability to leverage shared information through effective decision-making is pivotal to the

successful management of drug inventories in the healthcare system. The UAE's healthcare system recognizes the importance of effective decision making in promoting information sharing and highlights the need for evidence-based decision making supported by robust information sharing practices to enhance inventory management outcomes. In conclusion, effective decision-making serves as a critical mediator between information sharing and the effectiveness of the drug inventory management system in the UAE. Through effective decision making processes, shared information is transformed into actionable insights, improving coordination, resource allocation, and ultimately enhancing inventory management practices and patient care outcomes.

H7: Effective decision making mediates the relationship between big data factors and the effectiveness of the UAE drug inventory management system.

2.7. The Research Framework

In this research, the proposed conceptual framework builds upon IPT, RBT, and the Rational Decision-Making Model to understand the effects of big data factors (Data Integration, Data Processing, Data Quality, Data Security, and Information Sharing) on Effective Decision Making, and how this in turn influences the Effectiveness of the UAE Drug Inventory Management System. According to IPT, organizations function akin to humans in the processing of information for decision making (March, 1991). The key components of IPT, such as data acquisition, storage, retrieval, and utilization, map onto the five big data factors considered in this research. These components, when effectively managed, are expected to enhance the decision-making process within the UAE drug inventory management system (Galbraith, 1973; Chen, Chiang and Storey, 2012). RBT considers the role of resources and capabilities within an organization as drivers of competitive advantage (Barney, 1991). In the context of this research, the big data factors can be seen as unique resources that, when effectively utilized, can improve decision making and subsequently enhance the effectiveness of the drug inventory management system. The Rational Decision-Making Model provides an understanding of the step-by-step decision-making process, emphasizing rationality and logical choices (Simon, 1955). The model implies that effective management of big data factors should inform rational decision-making processes, leading to optimization of the drug inventory management system.

In essence, this research's conceptual framework views the big data factors as key resources (RBT perspective) that need to be effectively managed (IPT perspective) to improve the decision-making process (Rational Decision-Making Model). Effective decision making, in turn, is hypothesized to enhance the effectiveness of the UAE drug inventory management system. The conceptual framework of this research revolves around the interplay of data integration, data processing, data quality, data security, and information sharing as independent variables; effective decision making as a mediator; and the effective drug inventory management system as the dependent variable. The independent variables of the research, which are the big data factors, consist of data integration, data processing, data quality, data security, and information sharing (Khan, 2019). These big data factors represent various elements in data management that are crucial in influencing the decision-making process within the context of drug inventory management. The mediator variable, effective decision making, plays a pivotal role in this framework. It embodies the process where healthcare providers efficiently use information and resources to make rational decisions associated with drug inventory management (Simon, 1955). The research posits that effective decision making mediates the relationship between the big data factors and the performance of the drug inventory management system. Finally, the dependent variable of this research is the effective drug inventory management system. This represents the system's overall outcome or performance, ensuring that necessary drugs are readily available when needed. Effective decision making, influenced by the efficient management of big data factors, is hypothesized to significantly impact the drug inventory management system (Aljumah et al., 2021). The conceptual framework proposes that effective big data management leads to better decision making, which then results in a more effective drug inventory management system. Through this lens, the research aims to discover strategies that will enhance the drug inventory management within the healthcare sector of the UAE. By managing big data effectively through the above factors, healthcare providers make more effective decisions about drug inventory management, leading to a more efficient drug inventory management system. Effective decision-making processes help healthcare providers to optimize inventory levels, reduce the risk of shortages, and ensure that patients have access to the medications they need, when they need them. Based on theoretical background, the research model is developed (see Figure 1).

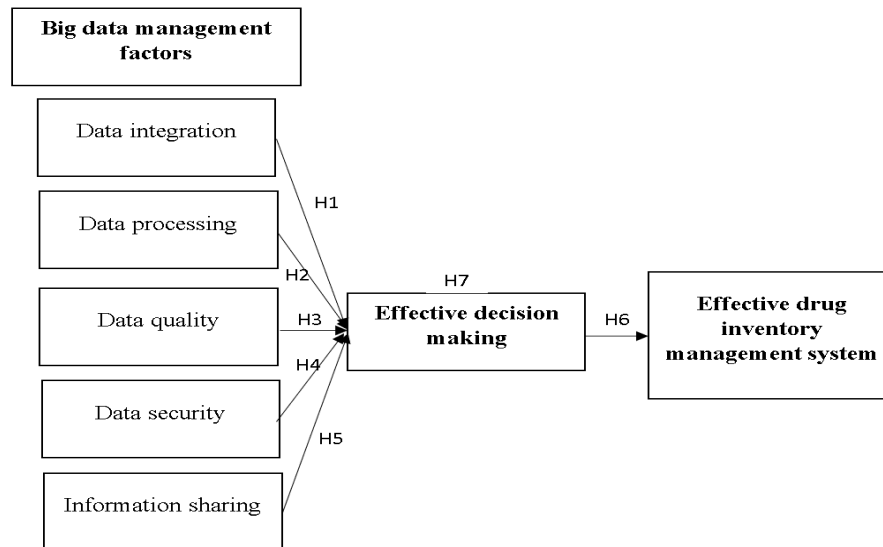


Figure: 1 Research Framework

This proposed framework has been crafted through a thorough review of existing literature, drawing upon research that highlights the relationship between big data factors and effective decision-making in healthcare, particularly in the drug inventory management system. The inclusion of data integration, data processing, and data quality in the framework is supported by studies that underscore their significance in decision-making processes in healthcare. For example, El Morr and Subercaze (2020) illustrate the substantial impact of data quality on decision-making in healthcare, leading to the hypothesis that there is a significant relationship between these data factors and effective decision-making in the UAE drug inventory management system. Similarly, the framework's focus on data security is derived from research that emphasizes its importance in health information systems, like the study conducted by Al-Khoury (2012). The concept of information sharing as an essential component of the framework aligns with the literature advocating its crucial role in facilitating effective communication and collaboration among healthcare professionals (Al Ameri et al., 2020).

Effective decision-making as a mediating factor is drawn from research emphasizing its role in enhancing the utilization of data and improving healthcare performance (Shahmoradi et al., 2017; Ghanem et al., 2019). Finally, the framework's emphasis on the effectiveness of the drug inventory management system as an outcome variable stem from a general consensus in the literature about the crucial role of effective decision-making in improving healthcare services and outcomes. Therefore, the proposed framework is a distillation of key themes identified in the literature and tailored to the specific context of the UAE's healthcare system and its drug inventory management. By weaving these elements together, the framework provides a comprehensive approach to understanding and improving decision-making processes in the UAE drug inventory management system.

3. Data and Methodology

Respondents of the present research are employees involved in drug inventory management systems in public healthcare institutions in the UAE. However, considering the results of the pilot research, the actual field sample was modified to increase the chances of reaching this minimum sample by the end of the survey. 364 questionnaires were distributed to the sample. From the distributed questionnaires, 324 were returned and collected, 297 questionnaires were the net returned and usable questionnaires with a percentage of 81.6 %, as 27 questionnaires are neglected due to incomplete information. Nonetheless, the minimum sample requirement for generalisation was met. A period of six (6) weeks was allocated to collect data. The results were downloaded from the online data collection platform and analyzed with Analysis of (Smart PLS). The collected data was originally entered into the online data collection platform based on the weights of the various responses..

3.1 Demographic Analysis

Table 1 shows the respondents profile for those participated in the study. As shown in the table, 72.4% of the participants belong to the male gender category and (n=215), while 27.6% of the participants belong to the female gender category and (n=82). The result confirms that male respondents were the majority. In terms of the age of the participants, it has been noted that most of the respondents were in the range of 36-45 years old with n = 98 presenting 33.1%. It also found that there were 46 participants were in the range of 18-25 years old presenting 15.4%. There were 67 participants were in the range of 26-35 years old presenting 22.6%. And finally, there were 86 participants were in the age of above 45 years old presenting 28.9%. According to the results showed in table 4.2, most of the participants hold bachelor certificates with a percentage of 39.5% and n = 117, The study also found that there were 114 participants hold master certificates with a percentage of 38.4%. There were 28 participants hold PhD certificates with a percentage of 9.4%. Finally, there were also, 38 participants hold other certificates with a percentage of 12.7%. It ensures that all the participants were well educated. The experience of the participants ranged between less than 1 years and more than 5 years, 2.6% of the participants had an experience with less than 1 year with n = 7. Also, there were 17.5% of the participants had an experience with 1 to 3 years with n = 52, 29.7% of the participants had an experience from 3 to 5 years with n = 88, and finally, 50.2% of the participants had an experience more than 5 years with n = 150. Most of the respondents were well experienced.

Table: 1 Profile of Respondents (N = 297)

	n	%		n	%
Gender			Education Level		
Male	215	72.4	Bachelor	117	39.5
Female	82	27.6	Master	114	38.4
			PhD	28	9.4
			Other	38	12.7
Age			Work Experiences		
18-25 years old	46	15.4	Less than 1 year	7	2.6
26-35 years old	67	22.6	1 to 3 years	52	17.5
36-45 years old	98	33.1	3 to 5 years	88	29.7
46 years old and above	86	28.9	More than 5 years	150	50.2

3.2 Measurement Model Evaluation

For the current study, the value used to test the convergent validity is the average variance extracted (AVE). When the value of AVE is greater than 0.5 then the variable shows good construct validity. The following table 2 shows that the variables (data integration, data processing, data quality, data security, information sharing, effective decision making, and effective drug inventory management system) have got an acceptable AVE value, which were ranged between 0.579 and 0.794. The factor loading test was used in the study to confirm the validity of the study data. The accepted value for the factor loading is to be greater than 0.5. The following table 2 reveals that the variables (data integration, data processing, data quality, data security, information sharing, effective decision making, and effective drug inventory management system) items' have got acceptable factor loading values, which were ranged between 0.598 and 0.996.

Table: 2 Measurement Model Evaluation

Factors	Items	Loading	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Data integration	DI1	0.848	0.835	0.927	0.653
	DI2	0.984			
	DI3	0.823			
	DI4	0.753			
Data processing	DP1	0.761	0.759	0.893	0.794
	DP2	0.698			
	DP3	0.878			
	DQ1	0.680			
Data quality	DQ2	0.756	0.801	0.989	0.579
	DQ3	0.996			
	DQ4	0.765			
	DS1	0.836			
Data security	DS2	0.598	0.973	0.942	0.639
	DS3	0.827			

Effective decision making	DS4	0.946			
	DS5	0.883			
	EDM1	0.880			
	EDM2	0.894			
	EDM3	0.784	0.787	0.895	0.753
	EDM4	0.984			
Information sharing	EDM5	0.904			
	EDM6	0.770			
	IS1	0.833			
Effective drug inventory management system	IS2	0.739	0.865	0.861	0.659
	IS3	0.786			
	EDIMS1	0.816			
	EDIMS2	0.759			
	EDIMS3	0.837	0.793	0.991	0.728
	EDIMS4	0.915			
	EDIMS5	0.829			

CR= Composite Reliability; AVE= Average Variance Extracted

3.3 Discriminant Validity

When evaluating novel tests, they emphasized the need of employing both discriminant and convergent validation procedures. A satisfactory discriminant validity research demonstrates that a concept test is not substantially associated with other tests measuring conceptually distinct ideas. According to the following table 3, the variables have shown perfect and positive correlation because all the variables obtained values of $r =$ greater than 0.4. The values found for the variables (data integration, data processing, data quality, data security, information sharing, effective decision making, and effective drug inventory management system) were in the range of 0.711 and 0.906.

Table: 3 Results of discriminant validity by Fornell-Larcker criterion

	DI	DP	DQ	DS	IS	EDM	EDIMS
Data integration	0.841						
Data processing	0.293	0.729					
Data quality	0.623	0.521	0.906				
Data security	0.875	0.616	0.313	0.793			
Information sharing	0.423	0.612	0.559	0.294	0.802		
Effective decision making	0.456	0.314	0.187	0.741	0.273	0.711	
Effective drug inventory management system	0.439	0.222	0.622	0.215	0.201	0.587	0.886

Based on the above discussion, it can be confirmed that the measurement is valid for further analysis as suggested by Hair et al. (2019).

3.4. Hypotheses Testing

Testing hypotheses is the most important test in the current research since it shows whether or not the goals of the research were met. Since there is a mediation in the current research, the direct effect test, and the indirect effect test will be used to examine the hypotheses. The following Table 4 and 5 shows the results of the direct effect test followed by some explanations.

3.4.1 Hypothesis Testing (Direct Effect)

This section presents the result of hypotheses testing for direct effect. The direct effect test aims to examine the relationships between the independent variables and the dependent variable. The results are presented in table 4 and explained in the following conclusions.

Table: 4 Summary of the Direct Effect

	Beta	SD	T	P Values
DI -> EDIMS	0.376	0.043	3.412	0.002
DP -> EDIMS	0.235	0.071	5.633	0.004
DQ -> EDIMS	0.520	0.081	7.419	0.000
DS -> EDIMS	0.401	0.019	1.238	0.084
IS -> EDIMS	0.359	0.099	5.169	0.000
EDM -> EDIMS	0.415	0.074	7.524	0.003

Where:

DI: data integration,

DP: data processing,

DQ: data quality,

DS: data security,

IS: information sharing,

EDM: effective decision making,

EDIMS: effective drug inventory management system

According to results showed in the above table 4, the following conclusions were drawn:

- There is a positive and significant relationship between data integration and effective drug inventory management system in UAE with $\beta = 0.376$, $t = 3.412$, and $p = 0.002$.
- There is a positive and significant relationship between data processing and effective drug inventory management system in UAE with $\beta = 0.235$, $t = 5.633$, and $p = 0.004$.
- There is a positive and significant relationship between data quality and effective drug inventory management system in UAE with $\beta = 0.520$, $t = 7.419$, and $p = 0.000$.
- There is no relationship between data security and effective drug inventory management system in UAE.
- There is a positive and significant relationship between information sharing and effective drug inventory management system in UAE with $\beta = 0.359$, $t = 5.169$, and $p = 0.000$.
- There is a positive and significant relationship between effective decision making and effective drug inventory management system in UAE with $\beta = 0.415$, $t = 7.524$, and $p = 0.003$.

3.4.2 Hypothesis Testing (mediation effect)

In this section, the results on assessing the mediation effect of effective decision making on the relationships between (data integration, data processing, data quality, data security, and information sharing) and effective drug inventory management system in UAE. Table 5 shows the result of the mediating effects (Indirect Effect) followed by some conclusions..

Table: 5 Mediation Testing (Indirect Effect)

	Path a	Path b	Indirect Effect	SE	t-value	Decision
DI ->EDM-> EDIMS	0.635	0.128	0.645	0.038	4.476	Mediation
DP ->EDM-> EDIMS	0.261	0.653	0.557	0.046	2.578	Mediation
DQ ->EDM-> EDIMS	0.534	0.653	0.294	0.079	6.266	Mediation
DS ->EDM-> EDIMS	0.694	0.365	0.346	0.085	1.368	No Mediation
IS ->EDM-> EDIMS	0.443	0.317	0.404	0.055	8.893	Mediation

The PLS-SEM was also utilized to test the mediating effect and the following conclusions were found:

- Effective decision making mediates the relationship between data integration and effective drug inventory management system in UAE with ($\beta = 0.645$, T value = 4.476, lower level = 0.472 and upper level = 1.091).
- Effective decision making mediates the relationship between data processing and effective drug inventory management system in UAE with ($\beta = 0.557$, T value = 2.578, lower level = 0.392 and upper level = 0.828).
- Effective decision making mediates the relationship between data quality and effective drug inventory management system in UAE with ($\beta = 0.294$, T value = 6.266, lower level = 0.705 and upper level = 0.902).
- Effective decision making does not mediate the relationship between data security and effective drug inventory management system in UAE.
- Effective decision making mediates the relationship between information sharing and effective drug inventory management system in UAE with ($\beta = 0.404$, T value = 8.893, lower level = 0.982 and upper level = 1.023).

4. Discussion

The current study has applied the direct effect test. The results of the present study indicate several important findings regarding the relationship between different factors of big data management and the effectiveness of the drug inventory management system in the United Arab Emirates (UAE). These findings contribute to the understanding of how these factors influence the efficiency and performance of the drug inventory management system in the UAE context. Firstly, the results reveal a positive and significant relationship between data integration and effective drug inventory management system in the UAE ($\beta =$

0.376, $t = 3.412$, $p = 0.002$). This finding is consistent with previous study that emphasizes the importance of integrating diverse data sources and systems to enhance decision-making processes (Smith et al., 2018). Integrated data allows for a comprehensive view of drug inventory, facilitating better inventory control and more informed decision-making, leading to improved effectiveness in managing drug inventory. Secondly, the study finds a positive and significant relationship between data processing and effective drug inventory management system in the UAE ($\beta = 0.235$, $t = 5.633$, $p = 0.004$). This aligns with prior studies that highlight the significance of efficient data processing techniques, such as data analytics and data mining, in optimizing inventory management (Li et al., 2019). Effective data processing enables the extraction of valuable insights from large datasets, assisting in demand forecasting, stock replenishment, and identifying patterns that aid in improving drug inventory management.

Moreover, the findings indicate a positive and significant relationship between data quality and effective drug inventory management system in the UAE ($\beta = 0.520$, $t = 7.419$, $p = 0.000$). This result is in line with previous study emphasizing the importance of data accuracy, completeness, and reliability in decision-making processes and inventory management (Zhang et al., 2017). High-quality data ensures that decisions regarding drug inventory management are based on accurate information, minimizing errors, reducing stockouts, and optimizing inventory levels. On the other hand, the study did not find a significant relationship between data security and effective drug inventory management system in the UAE. This unexpected finding contradicts prior studies that emphasize the importance of data security measures in maintaining the confidentiality and integrity of sensitive inventory-related information (Lee et al., 2020). However, it is important to note that data security remains a critical aspect of any inventory management system to protect against potential threats, comply with regulatory requirements, and maintain the trust and privacy of stakeholders. Additionally, the results reveal a positive and significant relationship between information sharing and effective drug inventory management systems in the UAE ($\beta = 0.359$, $t = 5.169$, $p = 0.000$). This finding is consistent with study highlighting the significance of information sharing among relevant stakeholders for efficient inventory management (Liao et al., 2019). Effective information sharing enables real-time communication, coordination, and collaboration among different entities involved in drug inventory management, leading to enhanced system effectiveness. Lastly, the study demonstrates a positive and significant relationship between effective decision-making and effective drug inventory management system in the UAE ($\beta = 0.415$, $t = 7.524$, $p = 0.003$). This finding supports prior study that emphasizes the critical role of effective decision-making processes in optimizing inventory management (Chen et al., 2021). Effective decision-making, informed by accurate and timely information, enables proactive inventory planning, demand forecasting, and risk management, ultimately enhancing the overall effectiveness of the drug inventory management system.

In summary for the direct effect test results, the results of the current study highlight the significance of various big data management factors in influencing the effectiveness of the drug inventory management system in the UAE. Data integration, data processing, data quality, information sharing, and effective decision-making are all identified as important factors contributing to the effectiveness of drug inventory management. These findings provide valuable insights for healthcare organizations and policymakers in the UAE to enhance their drug inventory management practices, promote data-driven decision-making, and improve overall patient care and safety. The current study has applied the mediation effect test. The results of the current study provide insights into the mediating role of effective decision-making in the relationship between different factors of big data management and the effectiveness of the drug inventory management system in the UAE. These findings contribute to a better understanding of the mechanisms through which big data management factors influence the effectiveness of drug inventory management, highlighting the importance of effective decision-making as a mediating variable.

Decision-making, recognized as a vital part of both everyday life and organizational behavior, lies at the heart of this research. Its pervasive influence extends beyond personal matters to also shape the trajectory of businesses, touching every aspect of internal and external organizational operations. This essentially makes the act of making accurate and effective decisions a non-negotiable component of business management. As such, the significance of precise decision-making cannot be understated, owing its centrality in determining the overall success or failure of an organization. This vital role has, consequently, elevated decision-making quality to an issue of global organizational concern. In light of this, there has been an increasing call for a more profound understanding of this phenomenon, with a particular focus on identifying and understanding the factors that contribute to its effectiveness. Businesses and researchers alike are actively seeking to decode the various elements needed to support sound decision-making, in an effort to prevent common pitfalls and enhance overall organizational efficiency. The urgency and importance of this matter are further underscored by the frequent observations of decision-making failures in management. All too often, the repercussions of these missteps can be devastating, leading to both financial loss and damage to the organization's reputation. These instances of abysmal failure have not gone unnoticed by the academic and business communities. As a result, they have sparked a renewed interest and focus on this area, driving researchers to delve deeper into the topic. The intent behind these efforts is to examine and clarify the applicability of specific theories and paradigms in the context of decision-making, with the ultimate goal of enhancing organizational success through improved decision-making processes.

5. Implications and Recommendations

The findings of this study have practical implications for healthcare organizations in the UAE. The identified relationships between big data factors, effective decision-making, and the drug inventory management system effectiveness can guide healthcare organizations in adopting data-driven practices, optimizing inventory control, and improving patient care outcomes. The study provides recommendations for policymakers in the UAE healthcare sector. These recommendations highlight the importance of fostering a supportive environment for data integration, data processing, data quality improvement, and information sharing in the drug inventory management system. Policymakers can utilize these recommendations to shape policies and initiatives that promote the effective use of big data and enhance inventory management practices. Based on the findings of the study and the understanding of the researcher to the topic, the researcher recommends the following:

1. Healthcare organizations should prioritize the integration of disparate data sources to create a comprehensive view of drug inventory. This can be achieved through the implementation of advanced data integration technologies and systems that consolidate data from various sources, including suppliers, distributors, and internal systems. Organizations should invest in robust data processing techniques and tools to effectively analyze and derive insights from the integrated data. This may involve utilizing advanced analytics techniques, such as machine learning algorithms and predictive modelling, to identify patterns, forecast demand, and optimize inventory levels.
2. Healthcare organizations should implement data quality management practices to ensure the accuracy, reliability, and completeness of inventory-related data. This includes conducting regular data quality assessments, implementing data validation processes, and establishing data governance frameworks to maintain data integrity throughout the inventory management system. Foster a culture of information sharing and collaboration among stakeholders involved in the drug inventory management system. This can be achieved by establishing secure platforms and systems for sharing inventory-related information, fostering communication channels, and promoting knowledge exchange between healthcare providers, suppliers, and regulatory authorities.
3. Provide training and support to decision-makers involved in drug inventory management to enhance their decision-making skills. This can include education on data analysis techniques, inventory optimization strategies, and the use of decision support tools. Encouraging a data-driven decision-making culture will enable informed and strategic choices to be made regarding drug inventory management.
4. Healthcare organizations should prioritize data security and privacy measures to safeguard sensitive inventory-related information. This includes implementing robust security protocols, encryption techniques, access controls, and regular security audits to protect data from unauthorized access, breaches, and cyber threats.

6. Conclusion

The study findings reveal significant relationships between various big data factors and the effectiveness of the drug inventory management system in the UAE. These factors include data integration, data processing, data quality, information sharing, and effective decision-making. The results highlight the importance of integrating disparate data sources, utilizing robust data processing techniques, ensuring data quality, fostering information sharing, and enhancing decision-making skills to improve the effectiveness of the drug inventory management system. The study contributes to the existing literature by expanding our understanding of the role of big data in healthcare inventory management, particularly in the UAE context. It establishes the mediating effect of effective decision-making in the relationship between big data factors and inventory management outcomes. Methodologically, the study employs rigorous statistical analysis techniques, enhancing the validity and reliability of the study findings. The practical implications of the study are significant for healthcare organizations and policymakers in the UAE. The findings provide valuable insights for optimizing drug inventory management practices, promoting data-driven decision-making, and improving patient care outcomes. The recommendations emphasize the importance of data integration, data processing, data quality improvement, information sharing, and decision-making skills in enhancing the drug inventory management system. Policymakers can utilize these recommendations to shape policies and initiatives that support the effective use of big data and improve inventory management practices. In conclusion, this study contributes to the existing body of knowledge by investigating the impact of big data factors and effective decision-making on the drug inventory management system in the UAE. The findings highlight the significance of leveraging big data and optimizing decision-making processes to enhance inventory management practices. The provided recommendations offer practical guidance for healthcare organizations and policymakers to improve drug inventory management and ultimately enhance patient care outcomes.

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